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INDUSTRIAL WASTE SURVEY REPORT

Environmental Health Center
Cincinnati, Ohio

1953

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INDUSTRIAL WASTE SURVEY REPORT

Firestone Tire and Rubber Company
Steel Products Division
Riverview, Michigan

May 4 to May 14, 1953

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Center
Cincinnati, Ohio

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I. GENERAL INFORMATION

1. Organization of Survey

This survey was a cooperative study conducted by the Steel Products Division of the Firestone Tire and Rubber Company, Riverview, Michigan, the Michigan Water Resources Commission, and the Environmental Health Center of the Public Health Service.

Analytical determinations were performed by Public Health Service chemists in a mobile laboratory located on the property of the Wayne County Sewage Treatment Plant at Wyandotte. Plant data pertinent to the survey were furnished by the personnel of the Firestone Tire and Rubber Company.

2. Dates of Survey

May 4, 5, 8, 11, and 14, 1953.

3. Purpose of Survey

This survey was conducted to determine the characteristics of the process wastes discharged from the plant to the Detroit River. This project was a part of the continuing study of boundary waters pollution being conducted for the International Joint Commission.

4. Personnel Participating

STEEL PRODUCTS DIVISION OF FIRESTONE COMPANY
- G. C. Parent, Plant Engineer
- J. E. Archer, Plant Chemist

PUBLIC HEALTH SERVICE
- D. M. Taylor, Public Health Engineer
- S. Soneda, Asst. Sanitary Engineer
- C. Shadix, Chemist
- S. Pinkoski, Chemist
- C. Hirth, Chemist
- P. Jones, Engineering Aide
- M. D. Currey, Laboratory Assistant

5. Location of Plant

This plant of the Steel Products Division of the Firestone Tire and Rubber Company is located at 17423 West Jefferson Avenue, Riverview, Michigan, approximately a half a mile south of the south corporate line of the Village of Wyandotte. It is on the west bank of the Trenton Channel of the Detroit River.

6. **Raw Material**

The principal raw materials and quantities used per month are as follows:

Bar and sheet steel	17,000,000 lb.
66° Bé H_2SO_4	340,000 lb.
Sodium cyanide	7,500 lb.
Soluble Oil	
Franklin 1000 gal.)	1,300 gal.
Texas 300 gal.)	
Oil, transformer, hydraulic, water, etc.	3,000 gal.

7. **Production**

The plant products and quantities are as follows:

Steel rims and side rings	12,750,000 lb.
General stampings	1,000,000 lb.
Steel cabinets	175,000 lb.
Fuel tanks	150,000 lb.
	14,075,000 lb.

8. **Operations**

The plant operates 24 hours per day, 5 days per week.

9. **Employees**

The total number of employees is about 1300.

10. **Water Supply**

Detroit River water is used for all industrial and fire fighting purposes. City water is used for sanitary purposes. The river water is treated with alum and sodium aluminate and then filtered before being used as process water. The portion of the river water going to the plant fire hydrant system is drawn prior to the filter.

A total of about 38,000,000 gallons of river water is pumped per month and distributed as follows:

Boiler feed	2,500,000 gal.
Power house cooling	4,000,000 gal.
Cleaning raw stock	6,000,000 gal.
Plating rinses	11,500,000 gal.
Welders	8,000,000 gal.
Cooling chutes	4,000,000 gal.
Hydraulic oil cooling	2,000,000 gal.

The total consumption of city water is about 3,000,000 gallons per month.

11. Process Wastes

The industrial wastes originating in the plant are discharged through a 16 inch diameter pipe extending 175 feet into the Detroit River.

12. Sanitary Wastes

All sanitary sewage is collected and discharged through an 8" drain to the Wayne County sewer on West Jefferson Avenue.

II. MANUFACTURING PROCESS

The manufacturing process at the Steel Products Division of the Firestone Company is described in the record of the industrial waste conferences held at the Wyandotte plant in 1947.

The process remains unchanged except that the production of spark plugs has been discontinued and the production of fuel tanks for military tanks has been introduced in recent years.

The process consists essentially of cleaning, pickling, and plating of raw stock; stamping and assembling of products; and painting of cabinets.

About 15% of the raw stock used at the plant is pickled before being received at the plant.

The remaining 85% of the raw stock is given a preliminary cleaning at the plant. This operation consists of a sulfuric acid bath followed by a cold water rinse and immersion in a hot alkaline solution.

The cleaned stock then goes to fabricating lines for stamping, welding, and other necessary operations required for completion of the parts involved. These fabricating lines are used almost exclusively for rims. Following fabrication, the rim stock is subjected to washing and oiling. Washing is done with a caustic cleaner (Wyandotte #63) followed by a rinse. The entire stock is cleaned but only about half of it is oiled. A light soluble oil is used for rust prevention and the oiled stock is shipped.

The unoiled stock continues through the process lines for further pickling and plating. The following operations, in series, and in the order shown, take place in these lines: (1) hot caustic bath; (2) cold water rinse; (3) sulfuric acid pickling; (4) cold water rinse; (5) cyanide bath and zinc plating; (6) hot water rinse; (7) cold water rinse; (8) weak cyanide bath and zinc plating; and (9) cold water rinse. The plated rim stock is then shipped out.

The raw cabinet stock goes to its process line for washing. A caustic cleaner (Wyandotte #63) is used, followed by a clear water rinse. After washing, the stock goes to fabrication, assembly, and paint lines. The painted cabinets are packed and shipped to the market.

The fuel tank stock goes to its process line. The stock is cleaned with a caustic cleaner (Wyandotte #63) and then given a cold water rinse. The stock is then fabricated, assembled and shipped out.

III. FRESH WATER USES

The principal fresh water uses in the process are:

(1) Cleaning raw stock
(2) Plating rinses
(3) Welders
(4) Cooling chutes
(5) Hydraulic oil cleaning

IV. WASTE SOURCES

The principal waste sources are caustic and acid dumps, caustic and acid rinses, oils, wash water, and cooling water. In general the flow of wastes is continuous, but there are some batch dumpings, principally of acid and caustic tanks.

The acid tank in the raw stock cleaning line is dumped once a week, generally towards the end of the week. The acid tanks in the plated rim process lines are dumped once per month. A total of about 32,000 gallons of 3% (by weight) sulfuric acid or about 8,000 pounds of acid as 100% H_2SO_4 is discharged to the river every month.

The caustic tanks in the plated rim process lines are dumped once each week. The amount dumped is about 12,600 gallons per week.

Acid and caustic solutions are carried over into the rinse tanks by the stock going through the process lines. The rinse tanks are significant sources of plant wastes.

The contents of the hot alkaline solution tank in the raw stock cleaning line is replenished as needed and little if any is spilled to the sewers.

The cyanide tanks in the plated rim process lines are cleaned as required. The solution is reused and replenished as needed. The sludge is dumped on the plant grounds. The content of the hot and cold water rinses between the two cyanide baths on these lines are discharged to the county sewer with the sanitary wastes.

The considerable quantity of oils being introduced to the plant sewer originate principally from the coating of parts for rust-proofing, any leaking valves and pipes, and floorwashings.

V. WASTE REDUCTION MEASURES

The plant had two major pollution problems in 1947, namely acid and oil. An attempt has been made by the plant management to solve both prob-

lems by the installation of a treatment system. The system consists of an oil separator, three ponds, and an outfall line extending into the Detroit River with a diffusion system at the outlet end.

The wastes first flow through the oil separator. There are two oil separators, in parallel, only one being operated at a time. Each separator is 7' - 8" x 20' in plan with a normal water depth of approximately 8'-4". A brick submerged baffle runs across the center of each unit at right angles to the direction of flow. The detention time in these units is about 10 minutes for a flow of 1.5 MGD going through one unit at a time.

An oil skimmer pipe is provided in each of the oil separators.

The oil is skimmed from the surface of the trap by a pump and stored in a tank. The salvaged oil is ultimately reused as road oil. About 2500 gallons of oil per month is recovered.

The separator effluent then passes through a system of three ponds in series. The first two ponds are small with a combined volume of about 150,000 gallons. The largest pond has a capacity of about 600,000 gallons. The flow from one pond to the next is through submerged openings in the dividing walls. All three ponds are shallow, i.e., the ratio of surface area to volume is high.

One objective of the pond is to effect a further reduction in the oil content of the wastes. Oil skimmer pipes are provided in one corner of each pond and the oil recovered in the ponds is pumped back to the separators.

The system of ponds also serve to equalize the concentration of the wastes being discharged to the river. The dilution water available in the ponds serve to damp out peak concentrations of any strong waste, such as the waste resulting from the dumping of the acid tank.

To promote proper diffusion of the waste in the river, the effluent from the large pond is discharged into the Trenton Channel of the Detroit River via a 16" diameter pipe. The opening in the pond is submerged. As designed, the water level in the large pond is approximately 15" above the average level of the river. The outfall pipe is of cast iron, but it is rubber lined to be acid resistant. The outfall pipe extends 175 feet into the river. The diffusion pipes protruding from the outfall pipe are 3-1/2 in. W. I. pipes (also rubber lined), each 3-1/2 ft. in length, pointed downstream at an angle of 45°. The diffusion pipes extend about 12 to 18 inches above the river bottom deposits. There are 18 such diffusion pipes spaced 6' apart through about 105' of the length of the outfall pipe.

A screen chamber is provided between the pond and the outfall pipe. The chamber houses a stainless steel #10 wire screen (3/8" mesh).

VI. SURVEY PROCEDURES

1. Sample Collection

The plant operation is on a 24-hour day, 5-day week basis.

Samples were manually composited at hourly intervals over 8-hour periods from 8 AM to 4 PM.

Chemical samples were composited in one-gallon glass bottles, while the oil samples were composited in a glass stoppered one-liter bottle.

A small pump was used to collect a single run of a continuous composite of the plant industrial waste effluent for chemical determinations only. The pump was started on May 14 and stopped 19 hours later.

All effluent samples were collected from the screen chamber between the pond and the outfall pipe extending into the river.

Composite samples of the river water were collected for the purpose of obtaining net values for quantities of waste discharged from the plant.

Through a misunderstanding, a process water line was designated as the raw water line. The "raw water" sampled during the survey period was actually the river water treated with alum and sodium aluminate and filtered. At a later date a set of grab samples was collected from the raw water intake for the determination of oil and iron. This set of samples also contained the chemical used in treatment since the alum and sodium aluminate are added at the point where the raw river water enters the pump house.

2. Flow Measurements

The large sedimentation basin serves to equalize the flow of wastes discharged into the river from the plant.

No flow measurements were taken of the effluent of the large pond. The flow of the wastes from the plant was based on the water pumpage figures supplied by the company.

3. Laboratory Analyses

The following laboratory determinations were made on the samples:

(1) BOD, 5-day 20°C.
(2) Total Solids
(3) Total Volatile Solids
(4) Suspended Solids

(5) Suspended Volatile Solids
(6) Iron
(7) Oils
(8) pH
(9) Acidity
  (a) Total
  (b) Mineral Acid

The procedures followed in making the determinations, with the exception of oils and iron, were those given in the "Standard Methods for the Examination of Water and Sewage," 9th edition. The procedure for oils was that given in the "Analytical Methods for Boundary Waters Quality Control," by the Board of Technical Advisers of the International Joint Commission. Iron determinations were made according to the procedure described in the "Colorimetric Determinations of Metals in Sewage and Industrial Wastes" (1). A photoelectric spectrophotometer was installed in the laboratory of the Wyandotte water plant for the purpose of making this determination.

VII. EXPLANATION OF ANALYSES

A brief explanation of the laboratory determinations is given below as an aid in the interpretation of the analytical results reported.

1. B. O. D.

The biochemical oxygen demand of sewage, polluted waters, or industrial wastes, is the oxygen (in ppm) required during stabilization of the decomposable organic matter by aerobic bacterial action. The rate of oxygen demand is dependent on both time and temperature and consequently the standard conditions of 5 days' incubation at 20°C are usually used for the test. Approximately 68 per cent of the oxygen demand of the carbonaceous material present in normal domestic sewage is satisfied under the conditions of 5 days' incubation at 20°C. The oxygen demand rates of industrial wastes, however, may or may not follow the typical oxidation curve for domestic sewage. It would be necessary to incubate a particular sample of waste for such a period of time that no more oxygen demand was exerted, in order to determine the total BOD.

High BOD values are objectionable from a stream pollution standpoint because they reduce the oxygen resources of the streams, adversely affecting the aquatic life. If the oxygen content is depleted, anaerobic conditions develop and the water is rendered undesirable for supply and recreational purposes.

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(1) Butts, P. C., and Gehler, A. R., with Mellon, M. G., "Colorimetric Determinations of Metals in Sewage and Industrial Wastes." Sewage and Industrial Wastes, 22, 12, 1543 (December 1950).

2. Solids

Suspended solids are insoluble solids which float on the surface of the liquid, remain in suspension, or settle out on standing. They are determined by filtering samples through asbestos mats in Gooch crucibles. Total solids consist of all the solids in a sample and include both suspended and dissolved solids. Volatile solids are those solids in the sample which are lost on ignition at a temperature of 600°C for 15 minutes.

Suspended solids cause water to appear turbid and unsightly. Suspended solids are particularly objectionable in water sources used for domestic and industrial water supplies. Relatively large amounts of dissolved solids may be objectionable in domestic water supplies for physiological reasons and in industrial water supplies for process reasons. Although the volatile solids determination is based on an empirical method, the results of this determination are intended to indicate the organic content of the solids.

3. Oils

The oil results were obtained by extracting the samples with a 1:1 mixture (by volume) of diethyl ether and carbon tetrachloride. These results represent all of the materials which are soluble in these organic solvents, and not just the true oils as such.

Oily materials are objectionable from the standpoint of stream pollution because they are unsightly, damaging to wildlife and aquatic life, detrimental to recreational facilities, and interfere with treatment processes for public and industrial water supplies. Oily films on the surfaces of lakes and streams interfere with the normal reaeration of the water and may be difficult to remove. Certain sludges may contain oily materials which may be toxic to bottom fauna and flora.

4. Iron

Iron is determined colorimetrically using 1,10-phenanthroline in acetate buffered solution. The separation of iron from interfering materials is effected by extraction with diisopropyl ether from hydrochloric acid solution.

Iron in relatively low concentrations can be of nuisance in water to be used for domestic or industrial purposes, particularly the latter. Unless reduced by treatment to below 0.3 or 0.5 ppm prior to its use as a supply it lends to disagreeable tastes and odors, forms rusting precipitates, and promotes undesirable growths in conduits carrying such supplies.

5. pH

The symbol "pH" denotes the negative logarithm of the hydrogen-ion normality. The pH value indicates the relative acidity or alkalinity of a solution, being lower with higher degrees of acidity. pH data are helpful in measuring the effects of acid and alkaline wastes on natural surface waters. Acids causing pH values below 4.0 and alkalies causing pH values above 10.0 are undesirable and hazardous for fish life in waters which are not naturally so acid or alkaline. pH is also an important factor when considering treatment for domestic and industrial water supplies.

6. Acidity

The acidity of a water is usually caused by the presence of uncombined carbon dioxide, mineral acids, and salts of strong acids and weak bases. Industrial wastes may contain acid materials capable of producing hydrogen ions in solution. The amount of acidity is determined by titration with a standard solution of a strong base to a definite equivalence point as given by indicator solutions. Methyl orange indicator (pH approximately 4.0), or its equivalent, is used to obtain this equivalence point for the "mineral acid acidity." Phenolphthalein or its equivalent (pH 8.1 - 8.2) is used to obtain the equivalence point for total acidity. Total acidity includes mineral acid acidity. Acidity results are expressed as ppm calcium carbonate.

The common strong mineral acids (H_2SO_4, H_2SO_3, HCl, and HNO_3) can be directly lethal to fish in most natural waters when the pH is 5.0 or lower. A number of weak inorganic and organic acids can impart to some waters pronounced toxicity for fresh-water fish without lowering the pH to a value as low as 5.0. The toxicity under these conditions is attributable chiefly to the undissociated acid or acid gas in solution, or to the anions or salts of the acid involved. Sulfurous acid is included in this last group. The pH value alone may not be regarded as a reliable index of dangerous pollution of water with one of the acids of this group. Both the concentration and the pH of the solution usually must be considered.

VIII. DISCUSSION OF RESULTS

The daily and average, gross and net, concentrations of the waste constituents discharged from this plant of the Steel Products Division of the Firestone Company are shown in Table 1.

As indicated under Article VI, Section 1, the raw water samples collected during the course of the survey in the plant was actually treated river water. The oil and iron determinations made on the grab sample from the raw water intake line (collected June 5) are also indicated on Table 1.

Fortunately the concentrations of iron and oils in the raw water are low compared to the concentration of the same waste constituent in the plant effluent that the effect of the raw water concentration values on the net value of the plant wastes are minor as can be seen in Table 1.

The quantities of waste constituents in lb./day based on a plant flow of 1.5 MGD are also presented in Table 2. The flow is assumed to have been constant over the survey period.

Oils, acid, and iron were the three determinations of primary interest.

The following criteria are among the listings under "Chemical Waste Other than Phenolic" in the Objectives for Boundary Waters Quality Con-

trol (I.J.C.):

"Adequate protection should be provided if:

(a) The pH of these waters following initial dilution is not less than 6.7 nor more than 8.5. This quality in the receiving waters will probably be attained if plant effluents are adjusted to a pH value within the range of 5.5 and 10.6.

(b) The iron content of these waters following initial dilution does not exceed 0.3 ppm. This quality in the receiving waters will probably be attained if plant effluents are limited to 17 ppm of iron in terms of Fe.

(c) Oils and floating solids are reduced to a point such that they will not create fire hazards, coat hulls of water craft, injure fish or wildlife in their habitat, or will adversely affect public or private recreational development or other legitimate shore line developments or uses. Protection should be provided for these waters if plant effluents or storm water discharges from pramises do not contain oils, as determined by extraction, in excess of 15 ppm, ..."

The pH of the wastes from this plant as indicated by the 8-hour composites during this survey ranged between 2.0 to 2.5.

The iron concentrations (as Fe) of the 8 hour composites averaged 497 ppm, with a range of 308 ppm to 658 ppm.

The oils of the 8-hour composites ranged between 16 ppm and 59 ppm, with an average concentration of 32 ppm.

With the exception of the BOD value, concentrations of the constituents as indicated by the 19-hour continuous composites compared favorably with the corresponding concentrations of the average of the 8-hour composites collected over the period of 4 days. Thus the samples collected during the 8 AM to 4 PM periods appear to have been representative of the water being discharged over the entire 24-hour plant cycle. The BOD concentration of the continuous composite is about double of that indicated by the average of the 8-hour composites.

	Average Net Quantity (lb/day)	Average Net Quantity (lb/ton of Product)
5-day BOD at 20°C	653	1.95
Total Solids		
Total	31,900	95.2
Volatile	20,100	60.0
Suspended Solids		
Total	403	1.20
Volatile	391	1.17
Acidity as $CaCO_3$		
Total	21,200	63.2
Mineral	12,400	37.0
Oils	384	1.15
Iron as Fe	6,200	18.5

Using a specific gravity of 0.9, 384 lb. of oil is equivalent to about 50 gallons of oil. On this basis, about 1,050 gallons of oil are being discharged to the river from this plant every month. The oil separators are reported to be recovering 2,500 gallons of oil monthly.

The quantities of oil used in the plant per month are:

Soluble oil	1,300 gallons
Oils, transformer, hydraulic, motor, etc.	3,000 gallons

The mineral acidity of the plant wastes amount to 12,420 lb/day as $CaCO_3$ or 12,200 lb/day as H_2SO_4. Thus on a monthly basis, the mineral acidity discharged is about 260,000 lb. The quantity of sulfuric acid reported to be used in this plant is 340,000 lb. per month. The difference may be attributed to the alkalinity of the water and alkaline processing materials.

IX. SUMMARY

1. The plant manufactures steel products, primarily automobile rims.

2. Iron, acid, and oils are the principal pollution problems.

3. Recovery of the bulk of the oils in the waste is attempted in the separator. A system of three ponds in series also serves to recover any oils that pass through the separator.

4. Dilution water available in the ponds also serve to damp out peak concentration of pickling wastes which are dumped periodically.

5. The outfall pipe extending into the river has been designed so as to promote rapid diffusion of the plant waste in the river.

6. The net concentrations of iron, acidity (mineral), and oils averaged 497 ppm, 993 ppm, and 15 ppm, respectively, during the survey period.

7. The average net quantities of the principal waste constituents being discharged from this plant, based on an estimated waste flow of 1.5 MGD and a reported production of 14,075,000 lb. per month, are as follows:

	Total Quantities lb/day	Unit Quantities lb/ton of product
Iron	6,200	18
Mineral acidity	12,400	37
Oils	384	1.2

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TABLE 1 - GROSS AND NET CONCENTRAT

Steel Products Division of Firestone Tire and Rubber C

Date 1953	BOD (ppm) Gross	BOD (ppm) Net	Total Solids (ppm) Total Gross	Total Solids (ppm) Total Net	Total Solids (ppm) Volatile Gross	Total Solids (ppm) Volatile Net	Suspended Solids (ppm) Total Gross	Suspended Solids (ppm) Total Net	Suspended Solids (ppm) Volatile Gross	Suspended Solids (ppm) Volatile Net	Oils (ppm) Gross	Oils (ppm) Net*
Final Effluent 8-hr. Composites												
May 4	44	43	2390	2020	1230	1150	20	14	19	15	16	15
5	31	29	1950	1590	1050	950	25	18	21	15	22	21
8	61	59	3290	2930	2060	1910	81	74	74	70	59	58
11	79	78	4000	3650	2510	2440	33	23	30	25	29	28
Average	54	52	2910	2550	1710	1610	40	32	36	31	32	30
Maximum	79	78	4000	3650	2510	2440	81	74	74	70	59	58
Minimum	31	29	1950	1590	1050	950	20	14	19	15	16	15
Final Effluent 19-hr. Continuous Composite												
May 15	119		3410		2050		48		41		-	
Raw Water 8-hr. Composites**												
May 4	0.88		368		84		6		4		0	
5	1.64		360		98		7		6		0.4	
8	1.91		364		154		7		4		0	
11	1.35		346		72		10		5		0	
Average	1.45		360		102		7.5		5		0.1	
Maximum	1.91		368		154		10		6		0.4	
Minimum	0.88		346		72		6		4		0	
June 5 ϕ	-		-		-		-		-		0.8	

* Net quantities based on grab sample of raw water (June 5).** Actually process water-raw r
of alum and sodiu

*** Estimated

ϕ Special sample taken from intake line - grab

TABLE 1 - GROSS AND NET CONCENTRATIONS

oducts Division of Firestone Tire and Rubber Company, Riverview, Michigan

	Suspended Solids (ppm)									Acidity (ppm)			
	Total		Volatile		Oils (ppm)		Iron (ppm)			Total		Mineral Acid	
st	Gross	Net	Gross	Net	Gross	Net*	Gross	Net*	pH	Gross	Net	Gross	Net
50	20	14	19	15	16	15	474	473	2.4	1380	-	719	-
50	25	18	21	15	22	21	308	307	2.5	1070	-	542	-
10	81	74	74	70	59	58	549	548	2.2	1850	-	1240	-
40	33	23	30	25	29	28	658	657	2.0	2480	-	1470	-
10	40	32	36	31	32	30	497	496	-	1700	-	993	-
40	81	74	74	70	59	58	658	657	2.5	2480	-	1470	-
50	20	14	19	15	16	15	308	307	2.0	1070	-	542	-
	48		41		-		532		2.1	2020		1030	
	6		4		0		0.93		7.7	-		-	
	7		6		0.4		1.0**		7.7	-		-	
	7		4		0		1.02		7.7	-		-	
	10		5		0		1.25		7.7	-		-	
	7.5		5		0.1		1.07		-	-		-	
	10		6		0.4		1.25		7.7	-		-	
	6		4		0		0.93		7.7	-		-	
	-		-		0.8		1.26		-	-		-	

r water (June 5).**Actually process water-raw river water treated with addition of alum and sodium aluminate and with filtration

grab

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TABLE 2 - GROSS AND NET QUANTITIES

Steel Products Division of Firestone Tire and Rubber C
Riverview, Michigan

Date 1953	Flow MGD	BOD (lb/day)		Total Solids (lb/day)				Suspended Solids (lb/day)				Oils (lb/da	
				Total		Volatile		Total		Volatile			
		Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Ne
Final Effluent - 8 hr. Composites													
May 4	1.5	550	537	29,900	25,200	15,400	14,400	250	175	238	188	200	190
May 5	1.5	388	362	24,400	19,900	13,100	11,900	312	225	262	187	275	265
May 8	1.5	763	737	41,200	36,600	25,800	23,800	1010	925	925	875	738	728
May 11	1.5	988	975	50,000	45,700	31,400	30,500	413	288	375	313	362	352
Average	1.5	672	653	36,400	31,900	21,400	20,200	496	403	450	391	394	384
Final Effluent - 19 hr. Composite													
May 15	1.5	1490		42,700		25,600		600		513		-	

TABLE 2 - GROSS AND NET QUANTITIES

Steel Products Division of Firestone Tire and Rubber Company

Riverview, Michigan

...ds (lb/day)		Suspended Solids (lb/day)								Acidity		(lb/day)	
Volatile		Total		Volatile		Oils (lb/day)		Iron (lb/day)		Metal		Mineral	
Gross	Net	Gross	Net	Gross	Net	Gross	Net*	Gross	Net*	Gross	Net	Gross	Net
15,400	14,400	250	175	238	188	200	190	5930	5900	17,300		9000	
13,100	11,900	312	225	262	187	275	265	3850	3830	13,400		6780	
25,800	23,600	1010	925	925	875	738	728	6870	6850	23,100		15500	
31,400	30,500	413	288	375	313	362	352	8230	8210	31,000		18400	
21,400	20,200	496	403	450	391	394	384	6220	6200	21,200		12400	
25,600		600		513		-		6650		25,300		12900	